

**WHAT IS CLAIMED IS:**

1. A frequency converter for converting a frequency of an input signal to an arbitrary frequency, comprising:
  - 5 a polyphase structure filter for multiplying M polyphase filters each having  $N=L/M$  coefficients (where L and M are both positive integers) determined by dividing L coefficients by M, by M signals determined by sampling signals for a period K of a sine wave having a period M/K for one sampling period, on a one-to-one basis; and
  - 10 a sampling frequency converter with a conversion ratio M.
2. The frequency converter as set forth in claim 1, further comprising:
  - a polyphase structure filter or a sampling frequency converter with a
  - 15 conversion ratio M1, for multiplying M1 polyphase filters by M1 signals determined by sampling signals for a period K of a sine wave having a period M1/K for one sampling period, on a one-to-one basis; and
  - a polyphase structure filter or a sampling frequency converter with a conversion ratio M2, for multiplying  $M2=M-M1$  polyphase filters by M2 signals
  - 20 determined by sampling signals for a period K of a sine wave having a period M2/K for one sampling period, on a one-to-one basis.
3. The frequency converter as set forth in claim 1, further comprising:
  - 25 an I-fold interpolator (where I is a positive integer) arranged in a stage following the polyphase structure filter;
  - wherein the polyphase structure filter multiplies  $(M \times I)$  polyphase filters each having  $P=L/(M \times I)$  coefficients determined by dividing L coefficients by  $(M \times I)$ , by  $(M \times I)$  signals determined by sampling signals for a period K of a sine

wave having a period  $(M \times I)/K$  for one sampling period, on a one-to-one basis;  
and

wherein the sampling frequency converter performs  $1/(M \times I)$ -fold interpolation.

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4. The frequency converter as set forth in claim 1, further comprising:

a  $1/D$ -fold decimator (where  $D$  is a positive integer) arranged in a stage preceding the polyphase structure filter;

10 wherein the polyphase structure filter multiplies  $(M \times D)$  polyphase filters each having  $Q=L/(M \times D)$  coefficients determined by dividing  $L$  coefficients by  $(M \times D)$ , by  $(M \times D)$  signals determined by sampling signals for a period  $K$  of a sine wave having a period  $(M \times D)/K$  for one sampling period, on a one-to-one basis; and

15 wherein the sampling frequency converter performs  $(M \times D)$ -fold interpolation.

5. A frequency converter for converting a frequency of an input signal to an arbitrary frequency, comprising:

20 a polyphase structure filter for multiplying  $M$  polyphase filters each having as one coefficient a code calculated by dividing  $M$  codes (where  $M$  is a positive integer) by  $M$ , by  $M$  signals determined by sampling signals for a period  $K$  of a sine wave having a period  $M/K$  for one sampling period, on a one-to-one basis; and

25 a sampling frequency converter with a conversion ratio  $M$ ;  
wherein the input signal is correlated with the code.

6. A frequency converter for converting a frequency of an input signal to an arbitrary frequency, the frequency converter including a polyphase

structure filter having M polyphase filters with  $N=L/M$  coefficients determined by dividing L coefficients by M (where L and M are both positive integers), the frequency converter, comprising:

the polyphase filter including;

- 5                   a coefficient bank for switching one bank each time M input discrete time sequences are received, and assigning P kinds (where P is a positive integer larger than 2) of filter coefficient sequences to multipliers of the polyphase filters one by one;

- wherein the coefficient bank of an  $M^{\text{th}}$  polyphase filter provides
  - 10 P kinds of coefficient sequences for the  $M^{\text{th}}$  polyphase filter among P kinds of a total of M phase coefficients calculated by multiplying coefficients determined by repeating M original phase coefficient sequences of the polyphase filter P times in a phase direction by  $P \times M$  signals determined by sampling signals for a period K of a sine wave having a period  $P \times M/K$  for one sampling period, on a
  - 15 one-to-one basis.